

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* ICHIRO MASE,  
YASUYUKI NAKAMURA,  
YUICHI SHIMAKAWA,  
MAYUMI KOSAKA and  
YOSHIMI KUBO

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Appeal 2006-2489  
Application 09/900,771  
Technology Center 1700

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Decided: March 2, 2007

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Before PETER F. KRATZ, CATHERINE Q. TIMM, and LINDA M. GAUDETTE, *Administrative Patent Judges*.

TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal from the Examiner's decision rejecting claims 1 and 3-20. Because Appellants' appeal meets the requirements of 35 U.S.C. § 134(a), we have jurisdiction under 35 U.S.C. § 6(b).

We reverse.

## I. BACKGROUND

The invention relates to a composite material for controlling heat generated by electronic equipment mounted aboard space vehicles such as man-made satellites and spaceships (Specification 1:9-14). The composite material includes a high temperature insulator/low temperature conductor phase change material. At high temperatures, the material radiates heat. At low temperatures, the material radiates less heat and has high reflectivity in the thermal infrared light region. According to the Specification, in the past the phase-change material had to have a thickness of several hundred microns or more (Specification 5:16-19). Appellants are able to reduce the thickness by adding a base material to the structure. Claim 1 is illustrative of the subject matter on appeal:

1. A composite material heat controller for an object, the composite material heat controller comprising:

a base material that radiates a larger amount of heat at a high-temperature relative to that of the heat radiated at a low-temperature, the base material having a surface adapted to thermally contact a surface of said object; and

a phase-change substance overlying said base material having insulation properties at the high-temperature, metallic properties at the low-temperature, radiating a larger amount of heat at the high-temperature relative to a smaller amount of heat radiated at the low-temperature, and having a high reflectivity in the thermal infrared light region at the low-temperature;

wherein said phase-change substance comprises a thickness in the range from about one to about thirty microns.

The Examiner relies on the following prior art references to show unpatentability:

Dalby	US 4,669,685	Jun. 2, 1987
Idemitsu Kosan Co. Ltd. (Abstract)	JP 05-286702 A	Nov. 2, 1993
Babel	US 5,296,285	Mar. 22, 1994
Richards	US 5,439,706	Aug. 8, 1995
Perino	US 5,519,566	May 21, 1996
Setsune	US 5,527,767	Jun. 18, 1996
Okamoto	EP 0919647 A1	Jun. 2, 1999
Kamigaki (Abstract)	JP 11-162774 A	Jun. 18, 1999
Bjorndahl	US 6,005,771	Dec. 21, 1999
Long	US 6,176,453	Jan. 23, 2001
Oh (Abstract)	KR 2001-036859 A	May 7, 2001
Nakanishi	US 6,432,474	Aug. 13, 2002

The rejections as presented by the Examiner are as follows:

1. Claims 1, 4, 5, 8, 9, 12, 13, 15, 16, and 18-20 are rejected under 35 U.S.C. § 103(a) as unpatentable over Long in view of Okamoto;
2. Claims 3, 6, 7, 14, and 17 are rejected under 35 U.S.C. § 103(a) as unpatentable over Long in view of Okamoto and Babel;
3. Claim 10 is rejected under 35 U.S.C. § 103(a) as unpatentable over Long in view of Okamoto and Bjorndahl;
4. Claim 11 is rejected under 35 U.S.C. § 103(a) as unpatentable over Long in view of Okamoto and Dalby.

The other references are relied upon by the Examiner in response to Appellants' arguments.

## II. DISCUSSION

### A. The Issue

All of the rejections rely upon the combination of the teachings of Long with those of Okamoto. The dispositive issue on appeal arises out of Appellants' contention that the Examiner has not provided a sufficient reason, suggestion, or motivation within the prior art for combining the teachings of those references (Br. 7). The Examiner contends that the motivation to combine arises out of the teachings of Okamoto as well as the knowledge of those of ordinary skill in the art. The dispositive issue, therefore, is: Has the Examiner provided a level of evidence sufficient to support the finding of a reason, suggestion, or motivation to make the required modification?

### B. Facts

Long is directed to a radiator using a thermal control coating. The radiator serves to transfer heat generated within the spacecraft to free space and to reflect incident heat from solar radiation exposure (Long, col. 1, ll. 8-16). Long's radiator 22 includes a radiator body 30 and a coating 44 (Long, col. 4, ll. 50-51). The radiator body 30 is a good thermal conductor such as metal (Long, col. 8, ll. 6-8). The coating 44 is a white thermal control paint (Long, col. 4, ll. 50-54) meant to reflect incident thermal energy away from the spacecraft when the radiator is facing the sun (Long, col. 6, ll. 35-37).

Okamoto describes a heat control device that not only radiates heat but controls temperature by radiating different amounts of heat at different

temperatures. Instead of a conductive material and coating as in Long, Okamoto uses a phase-change material with temperature dependent radiation properties (Okamoto ¶ 0011). Okamoto arranges a several hundred micron thick film of phase-change substance directly onto the surface of the spacecraft (Fig. 5 and ¶ 0017). It is arranged on the spacecraft surface as a film, according to Okamoto, so that it is space-saving and light weight (Okamoto ¶ 0014).

Long's materials, unlike Okamoto's phase-change material, do not become insulators as the temperature changes.

According to the Examiner, Long describes a radiator body 30 and coating 44 (radiator 22) meeting the requirements of the claimed base material. According to the Examiner, one of ordinary skill in the art would have been motivated to apply the phase change material of Okamoto onto the radiator 22 of Long to allow the internal temperature of a spacecraft to be passively controlled within a desired temperature range and would have controlled the thickness of the phase change film to obtain a coating having a balance between weight and desired heat radiation/conduction properties.

### C. Principles of Law

The examiner bears the initial burden of presenting a *prima facie* case of obviousness. *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). To support the *prima facie* case, the examiner must show, by a preponderance of the evidence, that a person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, and motivated by the general problem facing the inventor, would have been led to make the combination recited in the claims. *In re Kahn*, 441 F.3d 977,

988, 78 USPQ2d 1329, 1337 (Fed. Cir. 2006). A suggestion, teaching, or motivation to combine the relevant prior art teachings does not have to be found explicitly in the prior art, as the teaching, motivation, or suggestion may be implicit from the prior art as a whole, rather than expressly stated in the references. The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. *In re Kahn*, 441 F.3d at 987-88, 78 USPQ2d at 1336.

We begin the analysis by considering the prior art from the viewpoint of one of ordinary skill in the art. *See In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1316 (Fed. Cir. 2000) (“A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field.”).

#### D. Analysis

Stepping back and viewing the prior art from the viewpoint of one of ordinary skill in the art, we cannot agree that the evidence supports the position of the Examiner. The Examiner has not explained why one of ordinary skill in the art would have applied the phase-change material of Okamoto in the thickness claimed onto Long’s radiator coating. Okamoto arranges a several hundred micron thick film of phase-change substance directly onto the surface of the heat radiation wall of a spacecraft (Fig. 5 and ¶ 0017). It is arranged on the spacecraft surface as a film, according to Okamoto, so that it is space-saving and light weight (Okamoto ¶ 0014).

Long is directed to a radiator 22 including a radiator body 30. This radiator body is made of thermally conducting material such as metal. It serves to remove heat generated by a heat source from the spacecraft, but unlike Okamoto's phase-change material, it does not become an insulator as the temperature changes. The Examiner has not sufficiently explained why one of ordinary skill in the art would further include the radiator 22 of Long in addition to the film of Okamoto and reduce the thickness of the phase-change material. The phase-change material serves a function, i.e., variable temperature insulating, that the materials of the radiator 22 of Long do not. On its face, it would appear that the Examiner's proposed combination would lose insulating function and be counter to Okamoto's desire to save space and lessen weight in a passive heat control device. We also note that the coating 44 of Long is a white thermal control paint (Long, col. 4, ll. 50-54) meant to reflect incident thermal energy away from the spacecraft when the radiator is facing the sun (Long, col. 6, ll. 35-37). One of ordinary skill in the art would not have covered this coating with another material.

#### E. Conclusion of Law

We find that the Examiner failed to provide a level of evidence sufficient to support the Examiner's finding of a reason, suggestion, or motivation to make the required modification to Long's radiator. Such a reason, suggestion, or motivation is required to support a *prima facie* case of obviousness under 35 U.S.C. § 103(a). This lack of evidentiary support is present in each of the rejections. None of the additional prior art references relied upon the Examiner cures the deficiency of the Long and Okamoto

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combination. Because the Examiner did not establish a prima facie case of obviousness, we need not discuss Appellants' rebuttal evidence.

## CONCLUSION

In summary, we reverse the decision of the Examiner rejecting claims 1 and 3-20 under 35 U.S.C. § 103(a).

REVERSED

tf/clj

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